

Claims

1. (Currently amended) A compound according to the formula $\text{La}_{1-x}(\text{M}, \text{M}')_x\text{Sc}_3(\text{BO}_3)_4$ where x from about zero to about one, $\text{M}_x\text{M}'_y\text{Sc}_z(\text{BO}_3)_4$ where x, y, and z sum to about four, and M and M' are selected from the group consisting of La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.
2. (Original) The compound according to claim 1 having nonlinear optical properties.
3. (Original) The compound according to claim 1 where M and M' are independently selected from the group consisting of Yb, Pr, Lu, and Y.
4. (Original) The compound according to claim 1 where if one of M or M' is Ce, then the remaining metal is other than Gd or Nd.
5. (Original) The compound according to claim 1 where if one of M or M' is La, then the remaining metal is other than Nd, or x is greater than 0.3.
6. (Original) The compound according to claim 1 where M_x is La, and the compound further satisfies the formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$ where each of x, y, and z is greater than zero, x, y and z sum to about four, and M_y is selected from the group consisting of rare earth metals if y is greater than 0.3, or is selected from the group of rare earth metals other than Nd, including La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.
7. (Original) The compound according to claim 6 where M_y is selected from the group consisting of Y, Lu, Yb, and combinations thereof.

8. (Original) The compound according to claim 6 having a formula $\text{La}_{1-x}\text{Y}_x\text{Sc}_3(\text{BO}_3)_4$ where x is greater than zero and less than one.
9. (Original) The compound according to claim 8 where x varies from about 0.2 to about 0.4.
10. (Original) The compound according to claim 8 where x varies from about 0.25 to about 0.35.
11. (Original) The compound according to claim 1 crystallized in the R32 space group.
12. (Original) The compound according to claim 1 further satisfying the formula $\text{La}_{1-x}(\text{M}, \text{M}')_x\text{Sc}_3(\text{BO}_3)_4$ where x is greater than zero and less than one, and M and M' are independently selected from the group of rare earth metals.
13. (Original) The compound according to claim 12 where M and M' are independently selected from the group consisting of La, Pr, Gd, Dy, Ho, Er, Yb, Lu, Sc and Y.
14. (Original) The compound according to claim 12 where M and M' are independently selected from the group consisting of Yb, Pr, Lu, and Y.
15. (Original) A nonlinear optical material according to the formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$, where x, y, and z are greater than 0 and sum to about 4, and M_y is selected from the group consisting of Y, Lu, Yb, and combinations thereof.
16. (Original) The nonlinear optical material according to claim 15 where x is from about 0.7 to about 0.8.
17. (Original) The nonlinear optical material according to claim 15 where the material crystallizes in the space group R32.

18. (Original) A nonlinear optical material, $\text{La}_{0.7}\text{Y}_{0.3}\text{Sc}_3(\text{BO}_3)_4$.
19. (Original) A composition, comprising:
a first material according to the formula $\text{M}_x\text{M}'_y\text{Sc}_z(\text{BO}_3)_4$, where x, y, and z sum to about four, and M and M' are selected from the group consisting of La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y; and
a second material.
20. (Original) The composition according to claim 19 where each of x, y, and z is greater than zero.
21. (Original) The composition according to claim 19 where the first material is operatively coupled to the second material.
22. (Original) The composition according to claim 19 where the first material is joined to the second material.
23. (Original) The composition according to claim 19 where the second material is a laser material or a nonlinear optical material.
24. (Original) The composition according to claim 19 where the second material also satisfies the formula $\text{M}_x\text{M}'_y\text{Sc}_z(\text{BO}_3)_4$, where M and M' independently are selected from the group consisting of the rare earth metals, x, y, and z are greater than zero, and x, y, and z sum to about four.
25. (Original) The composition according to claim 19 where M_x is La, and the compound further satisfies the formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$ where each of x, y, and z is greater than zero, x, y and z sum to about four, and M_y is selected from the group consisting of rare earth metals.
26. (Original) The composition according to claim 25 where y is greater than 0.3.

27. (Original) The composition according to claim 25 where M_y is selected from the group consisting of La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.

28. (Original) The composition according to claim 19 where the first material satisfies formula $La_{1-x}Y_xSc_3(BO_3)_4$ where x is greater than zero and less than one.

29. (Original) The composition according to claim 28 where x varies from about 0.2 to about 0.4.

30. (Original) The composition according to claim 28 where x varies from about 0.25 to about 0.35.

31. (Original) The composition according to claim 19 where the first material is crystallized in the R32 space group.

32. (Original) The composition according to claim 19 where the first material further satisfies the formula $La_{1-x}(Ln, Ln')_xSc_3(BO_3)_4$ where x is greater than zero and less than one, and M and M' are independently selected from the group of rare earth metals.

33. (Original) A device for generating high energy UV light, comprising:
a laser; and
a nonlinear optical material having the formula $M_xM'_ySc_z(BO_3)_4$ where x , y , and z sum to about four, and M and M' are selected from the group consisting of rare earth metals.

34. (Original) The device according to claim 33 where x , y and z each is greater than zero.

35. (Original) The device according to claim 33 where, with reference to the nonlinear optical material, M_x is La, and the compound further satisfies the formula $La_xM_ySc_z(BO_3)_4$ where each of x, y, and z is greater than zero, x, y and z sum to about four, and M_y is selected from the group consisting of rare earth metals.

36. (Original) The device according to claim 35 where y is greater than 0.3.

37. (Original) The device according to claim 35 where M_y is selected from the group of rare earth metals other than Nd, including La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.

38. (Original) The device according to claim 33 having a formula $La_{1-x}Y_xSc_3(BO_3)_4$ where x is greater than zero and less than one.

39. (Original) The device according to claim 38 where x varies from about 0.2 to about 0.4.

40. (Original) The device compound according to claim 38 where x varies from about 0.25 to about 0.35.

41. (Original) The device according to claim 33 where the material is crystallized in the R32 space group.

42. (Original) The device according to claim 33 where the material further satisfies the formula $La_{1-x}(M,M')_xSc_3(BO_3)_4$ where x is greater than zero and less than one, and M and M' are independently selected from the group of rare earth metals.

43. (Original) The device according to claim 42 where M and M' are independently selected from the group consisting of La, Pr, Gd, Dy, Ho, Er, Yb, Lu, Sc and Y.

44. (Original) The device according to claim 42 where M and M' are independently selected from the group consisting of Y, Pr, Gd, Yb and Lu.

45. (Original) The device according to claim 33 where the material has a formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$, where x, y, and z are greater than 0 and sum to about 4, and M_y is selected from the group consisting of Y, Lu, Yb, and combinations thereof.

46. (Original) The device according to claim 45 where x is from about 0.7 to about 0.8.

47. (Original) The nonlinear optical material according to claim 45 where the material crystallizes in the space group R32.

48. (Original) The device according to claim 33 where the material is $\text{La}_{0.7}\text{Y}_{0.3}\text{Sc}_3(\text{BO}_3)_4$.

49. (Original) A method for nonlinear generation of light, comprising:
providing a compound according to the formula $\text{M}_x\text{M}'_y\text{Sc}_z(\text{BO}_3)_4$ where x, y, and z sum to about four, and M and M' are selected from the group consisting of La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y; and
exposing the compound to a light source.

50. (Original) The method according to claim 49 where M and M' are independently selected from the group consisting of Y, Pr, Gd, Yb and Lu.

51. (Original) The method according to claim 49 where M_x is La, and the compound further satisfies the formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$ where each of x, y, and z is greater than zero, x, y and z sum to about four, and M_y is selected from the group consisting of rare earth metals if y is greater than 0.3, or is selected from the group of rare earth metals other than Nd, including La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.

52. (Original) The method according to claim 51 where M is selected from the group consisting of Y, Lu, Yb, and combinations thereof.

53. (Original) The method according to claim 49 where the compound satisfies formula $\text{La}_{1-x}\text{Y}_x\text{Sc}_3(\text{BO}_3)_4$ where x is greater than zero and less than one.

54. (Original) The method according to claim 53 where x varies from about 0.2 to about 0.4.

55. (Original) The method according to claim 53 where x varies from about 0.25 to about 0.35.

56. (Original) The method according to claim 49 where the compound is crystallized in an R32 space group.

57. (Original) The method d according to claim 49 further satisfying the formula $\text{La}_{1-x}(\text{M},\text{M}')_x\text{Sc}_3(\text{BO}_3)_4$ where x is greater than zero and less than one, and M and M' are independently selected from the group of rare earth metals.

58. (Original) The method according to claim 49 where the material satisfies formula $\text{La}_x\text{M}_y\text{Sc}_z(\text{BO}_3)_4$, where x, y, and z are greater than 0 and sum to about 4, and M_y is selected from the group consisting Y, Lu, Yb, and combinations thereof.

59. (Original) A method according to claim 49 where the material is $\text{La}_{0.7}\text{Y}_{0.3}\text{Sc}_3(\text{BO}_3)_4$.

60. (New) The compound of claim 1, according to the formula $\text{M}_x\text{M}'_y\text{Sc}_3(\text{BO}_3)_4$, where x and y sum to about one, and M and M' are selected from the group consisting of La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc and Y.